

**506.06. BASIS OF PAYMENT.**

The accepted quantities, measured as provided above, will be paid at the contract price per unit of measurement for the pay item listed below that is shown in the bid schedule. Payment will be full compensation for the work prescribed in this section.

(A) STRUCTURAL STEEL ..... POUND (KILOGRAMS)

## **SECTION 507 TIMBER STRUCTURES**

**507.01. DESCRIPTION.**

This work shall consist of constructing timber structures and the timber portions of composite structures, in accordance with these specifications and in reasonably close conformity with the details specified in the contract documents or established by the Engineer.

It shall include furnishing, preparing, fabricating, erecting, treating, and painting of timber. All timber, treated or untreated, shall be of the specified species, grades and dimensions. Also included shall be any required yard lumber of the sizes and grades specified and all hardware required for timber connections and ties.

**507.02. MATERIALS.**

- (a) Lumber and Timber (Solid Sawn or Glued Laminated). Use sawn lumber and timber conforming to the Specifications for Wood Products, AASHTO M168.

Structural glued laminated timber shall conform to the American National Standard ANSI/AITC A-190.1, Specification for Structural Glued Laminated Timber. The separate laminations shall not exceed 2 inches in net thickness. They may be comprised of pieces end-joined to form any length, of pieces placed or glued edge to edge to make wider ones, or of pieces bent to curved form during gluing. On glued-laminated structural members that are not to be preservative treated, apply an approved end sealer after end trimming of each completed member.

The grades of timber used for various structural purposes shall be as specified in the contract documents.

Furnish the following certificates of compliance to the Engineer, as appropriate, upon delivery of the materials to the job site:

- For timber and lumber, a Type B certification by an agency certified by the American Lumber Standards Committee that the timber or lumber conforms to the grade, species and any other specified requirements.
- For glued-laminated timber, a Type B certification by a qualified inspection and testing agency that the glued-laminated timber complies with the grade, species and other requirements outlined in ANSI/AITC A 190. 1.
- If the wood is to be treated with a preservative, furnish a Type B certification for the preservation treatment.

- (b) Steel Components. Rods, plates, eyebars, and shapes shall conform to the requirements of AASHTO M270, Grade 36 (Grade 250) unless otherwise specified.
- (c) Castings. Castings shall be cast steel or gray-iron, as specified, conforming to the requirements of Sections 725.03 and 725.04.
- (d) Hardware. Bolts, nuts, drift-bolts, and dowels shall be of mild steel. Washers shall be cast iron ogee or malleable iron castings, or they may be cut from mild steel plate, as specified in the contract documents.

Bolts shall have either standard square, hex or dome heads, or economy type (washer) heads. Nails shall be cut or round wire of standard form. Spikes shall be cut or wire spikes, or boat spikes, as specified. Unless otherwise specified, bolts shall comply with ASTM A307, and shall have coarse threads, Class 2 tolerance conforming to ANSI Standard Specifications.

All fasteners, including nails, spikes, bolts, dowels, washers, and lag screws shall be galvanized, unless otherwise specified in the contract documents or permitted.

- (e) Galvanizing. Unless otherwise specified in the contract documents, all hardware for timber structures shall be galvanized in accordance with AASHTO M232 or cadmium plated in accordance with AASHTO M299. All steel components, timber connectors, and castings, other than malleable iron, shall be galvanized in accordance with AASHTO M111.
- (f) Timber Connectors.

1. *Dimensions.* The various types of timber connectors shall generally conform to the dimensions shown in Tables 507-1 and 507-2 and to the dimensions specified in this Subsection 507.02(f).
2. *Split Ring Connectors.* Split rings of  $2\frac{1}{2}$  inches (65mm) and 4 inches (100mm) inside diameter shall be manufactured from hot-rolled carbon steel conforming to the Society of Automotive Engineers Specification SAE-1010. Each ring shall form a closed true circle with the principal axis of the cross section of the ring metal parallel to the geometric axis of the ring. The metal section shall be beveled from the central portion toward the edges to a thickness less than the midsection. It shall be cut through in one place in its circumference to form a tongue and slot.
3. *Shear-Plate Connectors.* Pressed steel shear-plates of  $2\frac{5}{8}$  inch (67mm) in diameter shall be manufactured from hot-rolled carbon steel conforming to the Society of Automotive Engineers Specification SAE-1010. Each plate shall be a true circle with a flange around the edge, extending at right angles to the face of the plate and extending from one face only, the plate portion having a central bolt hole and two small perforations on opposite sides of the hole and midway from the center and circumference.

Malleable iron shear-plates of 4 inches (100mm) diameter shall be manufactured according to ASTM A 47 (47m), Grade 32510 (Grade 22010), for malleable iron casting. Each casting shall consist of a perforated round plate with a flange around the edge extending at right angles to the face of the plate and projecting from one face only, the plate portion having a central bolt hole reamed to size with an integral hub concentric to the bolt hole and extending from the same face as the flange.

4. *Spike-Grid Connectors.* Spike-grid timber connectors shall be manufactured according to ASTM A 47 (47m), Grade 32510 (Grade 22010), for malleable iron casting.

Square grids shall consist of four rows of opposing spikes forming a  $4\frac{1}{8}$  inch (105mm) square grid with 16 teeth that are held in place by fillets. Fillets for the flat grid in cross section shall be diamond shaped. Fillets for the single curve grids shall be increased in depth to allow for curvature and shall maintain a thickness between the sloping faces of the fillets equal to the width of the fillet.

Circular grids of  $3\frac{1}{4}$  inch (83mm) diameter shall consist of eight opposing spikes equally spaced around the outer circumference and held in place by connecting fillets joint around the outer diameter and radial fillets projecting to a central circular fillet which forms a bolt hole opening of  $1\frac{1}{4}$  inches (32mm). Fillets in cross section shall be diamond shaped except that the inner circular fillet may be flattened on one side to provide for manufacturer identification.

**Table 507-1**  
**Typical Dimensions of Timber Connectors, inches (mm)**

	<u>Split Rings</u>	
	$2\frac{1}{2}$ (65)	4(100)
Split Ring:		
Inside diameter at center when closed	2.500(63.50)	4.00(101.60)
Thickness of metal at center	0.163(4.14)	0.193(4.90)(4.90)
Depth of metal (width of ring)	0.750(19.05)	1.00(25.40)
Groove:		
Inside Diameter	2.56(65.02)	4.08(103.63)
Width	0.18(4.57)	0.21(5.33)
Depth	0.375(9.52)	0.50(12.70)
Bolt Diameter:	$\frac{1}{2}$ (12.70)	$\frac{3}{4}$ (14.28)
Hole Diameter	$\frac{9}{16}$ (14.3)	$\frac{13}{16}$ (20.6)
Washers, Standard:		
Round, cast, or malleable iron:		
Diameter	$2\frac{5}{8}$ (66.67)	3(76.20)
Round, mild steel		
Diameter	$1\frac{3}{8}$ (34.92)	2(50.80)
Thickness	$\frac{3}{32}$ (2.38)	$\frac{5}{32}$ (3.97)
Square Plate, mild steel		
Length of side	2(50.80)	3(76.20)
Thickness	$\frac{1}{8}$ (3.17)	$\frac{3}{16}$ (4.76)

**Table 507-2 (English)**  
**Typical Dimensions of Timber Connectors (inches)**

<b><u>Shear Plates</u></b>				
Shear Plate:	$2\frac{5}{8}$	$2\frac{5}{8}$	4	4
Material		Pressed steel	Light gage	Malleable
Malleable				
Diameter of plate	2.62	2.62	4.03	4.03
Dia. of bolt hole	0.81	0.81	0.81	0.94
Thickness of plate	0.172	0.12	0.20	0.20
Depth of flange	0.42	0.35	0.64	0.64
Design steel straps or shapes for use with shear plates in accordance with accepted engineering practices.				
Hole Diameter in Straps or Shapes for Bolts	$\frac{13}{16}$	$\frac{13}{16}$	$\frac{13}{16}$	$\frac{15}{16}$
Circular Dap - Dimensions				
A	2.63	2.63	4.03	4.03
B		1.07	1.55	1.55
C	0.81	0.81	0.81	0.94
D		0.65	0.97	0.97
E	0.19	0.13	0.27	0.27
F	0.45	0.38	0.64	0.64
G	0.25	0.14	0.22	0.22
H		0.34	0.50	0.50
I	2.25	2.37	3.49	3.49
Bolt Hole-diameter in timber Washers, Standard:	$\frac{13}{16}$	$\frac{13}{16}$	$\frac{13}{16}$	$\frac{15}{16}$
Round, cast or malleable iron diameter	3	3	3	3
Round, medium steel minimum:				
Diameter	2	2	2	$2\frac{1}{4}$
Thickness	$\frac{5}{32}$	$\frac{5}{32}$	$\frac{5}{32}$	$\frac{11}{64}$
Square Plate:				
Length of Side	3	3	3	3
Thickness	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$

**Table 507-2 (Metric)**  
**Typical Dimensions of Timber Connectors (mm)**

<b><u>Shear Plates</u></b>				
	66.675	66.675	101.6	101.6
Shear Plate:				
Material	Pressed steel	Light gage	Malleable	Malleable
Diameter of plate	66.55	66.55	102.36	102.36
Dia. of bolt hole	20.57	20.57	20.57	23.88
Thickness of plate	4.37	3.05	5.08	5.08
Depth of flange	10.67	8.89	16.26	16.26
Design steel straps or shapes for use with shear plates in accordance with accepted engineering practices.				
Hole Diameter in Straps or Shapes for Bolts	20.64	20.64	20.64	23.81
Circular Dap - Dimensions				
A	66.80	66.80	102.36	102.36
B		27.18	39.37	39.37
C	20.57	20.57	20.57	23.88
D		16.51	24.64	24.64
E	4.83	3.30	6.86	6.86
F	11.43	9.65	16.26	16.26
G	6.35	3.56	5.59	5.59
H		8.64	12.70	12.70
I	57.15	60.20	88.65	88.65
Bolt Hole-diameter in timber	20.64	20.64	20.64	23.81
Washers, Standard:				
Round, cast or malleable iron diameter	76.20	76.20	76.20	88.90
Round, medium steel minimum:				
Diameter	50.80	50.80	50.80	57.81
Thickness	3.97	3.97	3.97	4.36
Square Plate:				
Length of Side	76.2	76.2	76.2	76.2
Thickness	6.35	6.35	6.35	6.35

**507.04. CONSTRUCTION METHOD.**

- (a) **Quality.** Provide first class quality-of-work throughout. Frame true and exact. Unless otherwise specified, drive nails and spikes with just sufficient force to set the heads flush with the surface of the wood. Deep hammer marks in wood surfaces shall be considered evidence of poor quality and sufficient cause for removal of the workman causing them.
- (b) **Storage of Material.** At the construction site, store lumber and timber in orderly piles or stacks. Store untreated material open-stacked on supports at least 12 inches (300mm) above the ground surface to avoid absorption of ground moisture and permit air circulation. Stack and sticker untreated material to permit free circulation of air between the tiers and courses. Provide protection from the weather by a suitable covering. Clear the ground underneath and near the timber of weeds and rubbish. Construct the storage area where water will not collect under or near the stored timber.
- (c) **Treated Timber.**
1. *Handling.* Carefully handle treated timber without sudden dropping, breaking of outer fibers, bruising, or penetrating the surface with tools. Use web slings. Do not use cant hooks, peaveys, pikes, or hooks. When using metal bands to bundle members, provide corner protectors to prevent damage to the treated timber.
  2. *Framing and Boring.* Perform all cutting, framing, and boring of treated timbers before treatment insofar as is practicable. When treated timbers are to be placed in waters infested by marine borers, avoid untreated cuts, borings, or other framings below high water elevation.
  3. *Cuts and Abrasions.* Field treat all cuts and all recesses formed by countersinking in creosote treated piles or timbers, and all abrasions, after having been carefully trimmed, as specified either in this Subsection 507.04(c)3, *Cuts and Abrasions*, or the following Subsection 507.04(c)4, *Bored Holes*. Cover all cuts and recesses with two applications of a mixture of 60% creosote oil and 40% roofing pitch, or brush coat cuts and recesses with at least three applications of hot creosote oil covered with hot roofing pitch. Fill recesses likely to collect injurious materials with hot roofing pitch. Unless specified otherwise, heat hot preservatives to a temperature between 150°F (66°C) and 200°F (93°C) Where particularly heavy coatings are required, a suitable plastic compound can be prepared by mixing 10% to 20% of creosote and 80% to 90% of coal-tar roofing pitch.

For timbers originally treated with pentachlorophenol, creosote, creosote solutions or water-borne preservatives, field treat all cuts, abrasions and recesses which occur after treatment with two liberal applications of a compatible preservative in accordance with the requirements of the American Wood Preservers Association Standard M 4 entitled, "Standard for the Care of Pressure Treated Wood Products."
  4. *Bored Holes.* Treat all holes bored after treatment by filling the holes with the preservative used for field treatment. After treatment, plug any holes not filled with bolts or other items with preservative treated plugs.
  5. *Temporary Attachment.* When removing forms or temporary braces attached to treated timber with nails or spikes, treat the resulting holes as required for bored holes and fill by driving galvanized nails, spikes or preservative treated plugs flush with the surface.

- (d) **Installation of Connectors.** Use one of the following types of timber connectors, as specified in the contract documents: the split ring, the shear plate, or the spike grid. Install the split ring and the shear plate types in precut grooves of dimensions as given herein or as recommended by the manufacturer. Force spike grids into the wood so that timbers will be in firm contact. Use pressure equipment that does not damage the wood. One acceptable method is to use high-strength bolts or rods fitted with low friction ball-bearing washers made for this purpose. Replace the high-strength bolt with specified bolts for the final installation. Embed all connectors of this type at a joint simultaneously and uniformly.

Cut connector grooves in timber concentric with the bolt hole. Make the grooves conform to the cross-sectional shape of the rings, and provide a snug fit. Make the inside groove diameter larger than nominal ring diameter in order that the ring will expand slightly during installation. (See Tables 507-1 and 507-2.)

Fabricate all structural members using connectors before preservative treatment. When prefabricated from templates or shop details, bolt holes shall not be more than  $\frac{1}{16}$  inch (1.5mm) from required placement. Bolt holes shall be  $\frac{1}{16}$  inch (1.5mm) larger than the finished bolt diameter. Bore bolt holes perpendicular to the face of the timber.

Store timber after fabrication in a manner that will prevent changes in the dimensions of the members before assembly. Cure timber before fabrication so that it will remain stable in its dimensions. Timber that shrinks during storage causing predrilled grooves for split rings or plates to become elliptical or causing bolt hole spacing to change will be sufficient reason for rejection.

- (e) **Holes for Bolts, Dowels, Rods, and Lag Screws.** Bore holes for round drift-bolts and dowels with a bit  $\frac{1}{16}$  inch (1.5mm) less in diameter than the bolt or dowel to be used. The diameter of holes for square drift-bolts or dowels shall be equal to the least dimension of the bolt or dowel.

Bore holes for machine bolts with a bit the same diameter as the finished bolt, except as otherwise provided for bolts in connectors.

Bore holes for rods with a bit  $\frac{1}{16}$  inch (1.5mm) greater in diameter than the finished rod.

Bore holes for lag screws with a bit not larger than the body of the screw at the base of the thread. To prevent splitting or stripping the threads, bore the hole for the shank the same diameter and to the same depth as the shank. The depth of holes for lag screws shall be approximately 1 inch less than the length under the head.

- (f) **Bolts and Washers.** Use a washer, of the size and type specified, under all bolt heads (except for timber bolts with economy type heads) and nuts which would otherwise come in contact with wood. Effectually lock the nuts of all bolts after they have been finally tightened.
- (g) **Countersinking.** Countersink where smooth or flush surfaces are required. Treat all recesses in treated timber, formed for countersinking, as specified in Subsection 507.04(c)3. Fill recesses likely to collect injurious materials with hot roofing pitch.

- (h) **Framing.** Accurately cut and frame all lumber and timber to a close fit in such manner that the joints will have even bearing over the entire contact surfaces. Mortises shall be true to size for their full depth and tenons shall fit snugly. No shimming will be permitted in making joints, nor will open joints be accepted.
- (i) **Framed Bents.**
1. *Mud Sills.* Firmly and evenly bed mud sills to solid bearing and tamp in place. Mud sills shall be pressure preservative treated for ground contact. Where untreated timber is permitted for mud sills, it shall be of heart cedar, heart cypress, redwood, or other durable timber as approved by the Engineer.
  2. *Concrete Pedestals.* Carefully finish concrete pedestals for the support of framed bents so that the sills or posts will take even bearing. Dowels for anchoring sills or posts shall be not less than  $\frac{3}{4}$  inch (20mm) in diameter and project at least 6 inches above the tops of the pedestals. Cast these dowels in the concrete pedestals. Concrete and reinforcing steel shall conform to the requirements of Sections 509, "Structural Concrete," and 511, "Reinforcing Steel," respectively
  3. *Sills.* Make sills to have true and even bearing on mud sills, piles, or pedestals. Drift-bolt sills to mud sills or piles with bolts of not less than  $\frac{3}{4}$  inch (20mm) diameter and extending into the mud sills or piles at least 6 inches (150mm), or by other types of connectors as detailed in the contract documents. When possible, remove all earth from contact with sills so that there will be free air circulation around the sills.
  4. *Posts.* Fasten posts to pedestals with dowels of not less than  $\frac{3}{4}$  inch (20mm) diameter, extending at least 6 inches (150mm) into the posts, or by other types of connectors as detailed on the plans. Fasten posts to sills by one of the following methods, as indicated on the plans
    - By dowels of not less than  $\frac{3}{4}$  inch (20mm) diameter, extending at least 6 inches (150mm) into posts and sills.
    - By drift-bolts of not less than  $\frac{3}{4}$  inch (20mm) diameter driven diagonally through the base of the post and extending at least 9 inches (225mm) into the sill. Drift bolts shall be driven in holes as required by Subsection 507.04(e) at a 45° angle and shall enter the post at least 6 inches (150mm) above the post base.
    - By other types of connectors as detailed in the contract documents.
  5. *Caps.* Place timber caps, with ends aligned, in a manner to secure an even and uniform bearing over the tops of the supporting posts or piles. Secure all caps by drift-bolts of not less than  $\frac{3}{4}$  inch (20mm) diameter, extending at least 9 inches (225mm) into the posts or piles, or by other types of connectors as detailed in the contract documents. Install the drift-bolts approximately in the center of the post or pile.
  6. *Bracing.* Bolt bracing through the pile, post, or cap at the ends and at all intermediate intersections using a bolt of not less than  $\frac{5}{8}$  inch (16mm) in diameter. Make bracing of sufficient length to provide a minimum distance of 8 inches (200mm) between the outside bolt and the end of the brace.



- (j) **Stringers.** Size and position stringers at bearings so that knots near edges will be in the top portions of the stringers. Outside stringers may have butt joints with the ends cut on a taper, but lap interior stringers to take bearing over the full width of the floor beam or cap at each end. Separate the lapped ends of untreated stringers at least  $\frac{1}{2}$  inch (12mm) for the circulation of air and securely fasten by drift-bolting where specified in the contract documents. When stringers are two panels in length, stagger the joints.

Unless otherwise specified in the contract, place cross-bridging or blocking at the center of each span. Neatly and accurately frame cross-bridging between stringers and securely toe-nail with at least two nails in each end. All cross-bridging members shall have full bearing at each end against the sides of stringers. Blocking shall be snug-fit and held in place by either prefabricated galvanized steel beam hangers or by tie-rods as detailed on the plans.

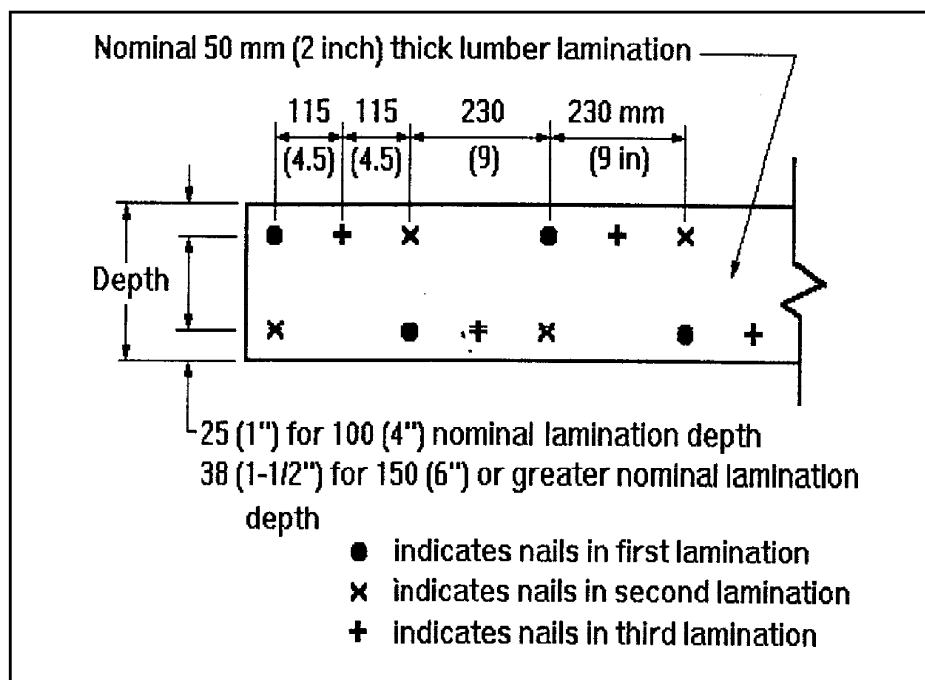
- (k) **Plank Floors.** Unless otherwise specified in the contract documents, provide planks for flooring surfaced four sides (S 4 S).

For single plank floors, provide a single thickness of plank supported by stringers or joists. Lay the planks heart side down, with  $\frac{1}{4}$  inch (6mm) openings between them for seasoned material and with tight joints for unseasoned material. Securely spike each plank to each joist. Carefully grade the planks as to thickness and lay so that no two adjacent planks vary in thickness by more than  $\frac{1}{8}$  inch (3mm).

For two-ply timber floors, provide two layers of flooring supported on stringers or joists. Lay the top course either diagonal or parallel to the centerline of roadway, as specified in the contract documents, and securely fasten each floor piece to the lower course. Stagger joints at least 3 feet (1000mm). If the top flooring is placed parallel to the centerline of the roadway, take special care to securely fasten the ends of the flooring. At each end of the bridge, bevel these members.

- (l) **Nail Laminated or Strip Floors.** Place the strips on edge, at right angles to the centerline of roadway. Nail each strip to the preceding strip as shown in Figure 507-1. The spikes shall be of sufficient length to pass through two strips and at least half-way through the third strip.

Figure 507-1  
Nail Placement Pattern



If using timber supports, toe-nail every other strip to every other support. Use the size of the spikes specified in the contract documents. When specified in the contract documents, securely attach the strips to steel supports by the use of approved galvanized metal clips. Take care to have each strip vertical and tight against the preceding strip, and bearing evenly on all the supports.

- (m) **Glue Laminated Panel Decks.** Unless otherwise specified in the contract documents, provide deck panels pressure preservative treated with creosote or pentachlorophenol with Type A, C or D carrier. When it is not possible to complete the fabrication and drilling of glulam members for field connections before treating, apply a preservative treatment to cut or drilled areas in the field, in accordance with Subsections 507.04(c)3 and 4.

Do not drag or skid panels. Handle and transport glue-laminated deck panels in a way to prevent bending the panels, especially transverse to the laminated pieces. When lifted, support the panels at a sufficient number of points to avoid overstressing, and protect the edges from damage.

When dowels are shown on the drawings between deck panels, use a template or drilling jig to ensure that dowel holes are accurately spaced. Drill the holes to a depth  $\frac{1}{4}$  inch (6mm) greater than one-half the dowel length and of the same diameter as the dowel unless otherwise shown in the contract documents. Use a temporary dowel as a check for snug fit prior to

production drilling. Use dowels of the size shown in the contract documents with the tips slightly tapered or rounded. A lubricant may be used to facilitate the connection process.

Start the tips of the dowels partially and equally into the holes of the two panels being joined. Draw the panels together keeping the edges parallel, until the panels abut tightly. Securely fastened each panel to each stringer or girder as shown in the contract documents.

- (n) **Composite Wood-Concrete Decks.** Furnish and install shear connectors, needed to resist shear and provide hold-down capacity between timber and concrete elements which are designed for composite action, in conformance with the details shown in the contract documents. If no such details are provided and the construction is described in the contract documents as being composite, submit working drawings for such details and devices for approval by the Engineer before the subject work is begun.
- (o) **Wheel Guards and Railing.** Accurately frame wheel guards and railing in accordance with the contract documents and erect true to line and grade. Unless otherwise specified in the contract documents, use wheel guards, rails, and rail posts surfaced four-sides (S 4 S). Lay wheel guards in sections not less than 12 feet (3700 mm) long, except where necessary to match expansion joints or end joints.
- (p) **Trusses.** Trusses, when completed, shall show no irregularities of line. Build chords to be straight and true from end to end in horizontal projection and, in vertical projection, show a smooth curve through panel points conforming to the correct camber. Fit all bearing surfaces accurately. Uneven or rough cuts at the points of bearing shall be cause for rejection of the piece containing the defect.
- (q) **Painting.** Paint rails and rail posts of timber and any other parts designated in the contract documents to be painted with three coats of white paint. Provide the type of paint specified in the contract documents. Do not apply paint to timber treated with creosote, or oil borne, pentachlorophenol preservatives, or timber having a moisture content exceeding 20%.

Give metal parts, except for hardware, galvanized or cadmium plated metal, and malleable iron, one coat of shop paint and, after erection, two coats of field paint as specified for IZ-E-U system in Section 512, "Painting."

#### 507.05. METHOD OF MEASUREMENT.

Timber and *lumber* shall be measured by the thousand board feet (cubic meter) of each species and grade of lumber and timber listed in the schedule of bid items, complete in place and accepted. Measurements of lumber and timber shall be computed from the nominal dimensions and actual lengths. The cross-sectional dimensions on the plans shall be interpreted as standard sizes. The standard cross-sectional dimensions shall be used in the computations even though the actual size is less in the dimension specified.

Timber in wheel guards shall be included. Timber in piling, railing and other items for which separate payment is provided will not be included.

Measurements for *glued laminated girders* and beams shall be computed from the applicable finished dimensions and actual lengths. Quantities for glue laminated girders and beams shall be paid for by the linear foot (meter) for each size and stress combination.

The measurement of lumber and timber and of glued laminated girders and beams shall include only such material as is a part of the completed and accepted work, and shall not include materials used for erection purposes, such as falsework, bracing, sheeting, etc.

#### 507.06. BASIS OF PAYMENT.

The accepted quantities, measured as provided above, will be paid for at the contract price per unit of measurement for the pay items listed below that are shown in the bid schedule.

- (A) LUMBER ..... M.F.B.M. (CUBIC METER)  
 (B) GLUE LAMINATED GIRDER (*DESCRIPTION*) ..... LINEAR FOOT (METER)

Payment for timber, lumber and glued-laminated girders and beams shall be considered to be full compensation for all costs of furnishing of materials, including hardware and timber connectors, preservative treatment, equipment, tools, and labor for the fabrication, erection, and painting necessary to complete all of the work in compliance with the plans and specifications in a satisfactory manner. Metal parts, other than hardware and timber connectors, will be measured and paid for as provided in Section 506. Concrete will be measured and paid for as provided in Sections 509.

### SECTION 508 CONCRETE CULVERTS

#### 508.01. DESCRIPTION.

This work shall consist of constructing concrete culverts in accordance with these Specifications and in reasonably close conformity with the lines and grades specified in the contract documents or established by the Engineer. Precast concrete box culverts may be used in lieu of cast-in-place concrete box culverts only if approved by the Engineer or permitted by the contract documents and, when used, comply with the contract documents.

#### 508.02. MATERIALS.

Materials shall meet the requirements specified in the following Subsections of Section 700 - Materials.

Structural Concrete ( <i>Class A</i> )	509
Reinforcing Steel for Structures	511

Precast concrete box sections for culverts shall meet the requirements of AASHTO M 259 or M 273. Joint materials shall meet the requirements specified under Subsection 726.02(a).

#### 508.04. CONSTRUCTION METHODS.

- (a) **General.** Comply with the applicable requirements of Sections 501, 502, 509 and 511. Construct curtain walls as directed by the Engineer to insure protection against undermining.

When the barrel length of cast-in-place culverts exceeds 60 feet (18m) , a construction joint may be placed in the culvert. When the barrel length of cast-in-place culverts exceeds 100 feet (30m) , place a construction joint in the culvert. Construct the joint according to the